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A FACTUAL APPROACH TO 2500 MC.
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A DISCUSSION OF 2500 MC INSTRUCTIONAL TELEVISION IS GIVEN COVERING THE HISTORY OF THE SYSTEM, THE NATURE OF 2500 MC SIGNALS, GEOGRAPHIC COVERAGE, EQUIPMENT REQUIREMENTS, COST GUIDELINES, AND THE IDENTIFICATION OF A SOURCE FOR ALL 2500 MC EQUIPMENT. (JT)

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2500 MD

A FACTUAL APPROACH

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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Educational Television, 15-5
Radio Corporation of America
Camden 2, New Jersey

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WHAT THE FCC APPROVED

On July 30, 1963 the FCC established the new Instructional Television Fixed Station Service to meet the needs of educators for the transmission of visual and aural instructional material to students enrolled in courses of formal instruction. They further stated that such a system may also be used for other purposes: the transmission of cultural material and entertainment to the same receiving locations; the transmission of special training material to selected locations outside the school system such as hospitals, nursing homes, training centers, clinics, rehabilitation centers, commercial and industrial establishments, etc.; the handling of administrative traffic of the licensee such as the transmission of reports and assignments, conferences with personnel, etc. However, stations will not be licensed solely for handling administrative traffic.

The FCC established thirty-one 6 megacycle channels in the frequency band 2500-2690 mc/s. Nominal transmitter power is 10 watts output, with higher power permitted only on special showing. A single licensee can apply for up to five alternate channels. The transmission standards are the same as regular television broadcasting with some exceptions.

THE NATURE OF 2500 MC SIGNALS

The 2500 mc frequency band lies far above even UHF and actually falls near the section of the spectrum usually used for microwave transmissions. At these frequencies, the signal is identical to microwaves in that it travels basically in a straight line-of-sight path, reflecting from some

objects and being absorbed by others. Therefore the nature of the terrain, the type and size of buildings and natural obstructions in the transmission path, and the height of the transmitting and receiving antennas are all factors which must be considered in setting up a system and determining costs.

GEOGRAPHICAL COVERAGE

Where the school district is small in size, with only a few schools, the 2500 mc signal could be transmitted in a narrow beam to each receiver location without any great problems, provided there are no major obstructions in the line of sight path from the transmitting to the receiving antennas. If the transmitting beam is very narrow, the signal might be transmitted as far as 25 miles or more.

However, if the school district is large, with many schools, the situation becomes more complex. In this situation, instead of being a simple point-to-point transmission, the many receiving points in all directions may require practically omni-directional transmission. As the angle of the transmitting beam is widened, the power and distance which a signal can be transmitted in any single direction is sharply diminished; beyond four or five miles, it may be necessary to increase the size (and cost) of the receiving antennas to obtain a good signal, or erect booster (translator) stations to cover the desired area beyond that distance.

EQUIPMENT REQUIREMENTS

Three basic elements must be combined to provide a complete system: (a) the program originating equipment; (b) the transmitting equipment and

(c) the receiving system.

a. Program originating equipment.

The video originating equipment would be identical to that required for a regular TV station or closed-circuit studio. This would include live vidicon or image orthicon cameras, video and audio switchers, monitors, audio equipment, power supplies, lighting equipment, test instruments and installation materials. If films and slides materials are to be transmitted, a multiplexer with TV film cameras, a 16mm projector, and slide projector would be needed. A television tape recorder would be required if instructional video tapes are to be recorded or transmitted.

b. Transmitting equipment.

Since the 2500 mc band had not been used to any extent, a special 10-watt transmitter has had to be developed for this purpose. The transmitter can be contained in a relatively small cabinet occupying only a few square feet of floor space. Special transmitting antennas are available, whether for omni-directional or highly directional use. Transmission lines or wave guides connect the transmitter to the antenna. If the geographical area to be covered is fairly extensive, booster (translator) transmitters would be required.

It is important to remember that each transmitter will handle only one channel. If multiple channels are planned, a separate transmitter will be required for each channel.

c. Receiving equipment:

1. Special receiving antennas, generally of the 2 or 4-foot parobolic reflector (microwave) type, are required to receive 2500 mc signals - standard TV antennas are not adequate. In omni-directional

broadcasting, reflectors larger than the 4-foot size may be required if the school is beyond six miles from the transmitting antenna. Receiving sites beyond eight miles require special consideration.

2. To convert the 2500 mc signal to the frequency of a usuable VHF receiver channel, a broadband converter is required at each school. A single converter will handle signals from up to five transmitters if they are on alternate channels.

3. To carry the now VHF signal to each room, a wired distribution system within the school or building will be required. This same distribution system can also be used to carry programs of regular UHF or VHF stations in the area, or be used for other closed-circuit purposes.

4. Standard school type TV receivers can be used in the classrooms or other locations, with the signal being picked up from an outlet tied into the distribution system.

COST GUIDELINES

The cost of such a system is dependent on the many variables involved: the number of schools to be reached, the terrain and the geographical area to be covered, the type and size of studio originating equipment, the number of transmitters (channels), etc.

The following are approximate costs of the various factors involved:

Equipment	Approximate Cost
Basic Studio equipment	$15,000 to $250,000
Transmitter & Antenna (each)	$13,500 to $15,000
Towers (depends on height)	$300 to $6,000
Broadband Converter (one required at each school) each	$900 to $1,000
Receiving Antenna & Distribution System	$1,000 up

School TV Receivers (each) $125 to $200

Booster (Translator) Transmitters (each) $7,000 up

A complete one-channel 2500 mc system to cover six nearby schools of 15 rooms each, with a modest studio, might cost in the range of $50,000 to $60,000. A 2-channel system for 20 schools, would probably run well over $100,000. As the size of the school system increases (in numbers of individual schools to be covered) the costs on the receiving end for converters, receivers and distribution systems increases much more rapidly than the cost of the studio and transmitting equipment.

Due to the special nature of 2500 mc transmission and the fact that each complete system is essentially custom tailored, budgetary figures can only be very rough estimates. In almost all instances, some sort of a preliminary survey will have to be made to determine the number of transmitters, translators, converters, antennas, as well as the height of towers, etc. Depending on the size and complexity of the system, such as in a city, a more extensive survey, on a billable basis, may be required before a complete list of equipment can be furnished and a definite cost established.

RCA - SINGLE SOURCE FOR ALL 2500 MC EQUIPMENT

RCA is in a position to supply all equipment required for a complete 2500 mc system. This includes studio equipment of all types, transmitters and translators, antennas, converters, and distribution systems and ETV receivers (the latter two items through the RCA Service Company which can also perform any surveys necessary).

For many years RCA has been the leading supplier of a complete line of television equipment for educational purposes. If you are planning a 2500 mc system, we would welcome the opportunity to assist in that planning by recommending the best system to achieve your objectives.

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